Acquired plant–animal interactions influence population growth rates of the invasive orchid *Spathoglottis plicata* in Puerto Rico

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Abstract: The Philippine ground orchid (*Spathoglottis plicata*) has invaded different tropical regions of the world, and in Puerto Rico, this species is causing negative ecological impacts. To assess the status of this invasive orchid, and the effects of plant–animal interactions on its population growth rates, we used a combination of field, experimental and modeling approaches. We focused on the interactions between the invasive orchid, the native weevil *Stethobaris polita*, and the invasive red fire ant *Solenopsis invicta*. Stage-structured matrix population models based on field observations gathered for four continuous years showed that the invasive population orchid is growing at a rate of 1.05, despite temporal variation and significant weevil damage to inflorescences. When fecundities are manipulated based on experimental exclusions, absence of weevil damage to flowers and fruits significantly increased λ to 1.22, while absence of ant visitation decreased λ to 1.04, with the latter not being significantly different from that obtained under field conditions. However, when demographic and environmental stochasticity are considered, exclusion of ants reduces the population size compared to the population size under field conditions when projected over time, and the stochastic population growth rate is significantly lower than the other treatments. Elasticity analyses show that survival and size-transitions, especially of larger size-stages, contribute the most to λ, rather than fecundities. Although there is some biotic resistance, weevil damage to inflorescences, alone, does not prevent population growth and expansion of *S. plicata*. When demographic and environmental stochasticity are considered, ants have a positive effect on the invasive orchid's λ, partially supporting the invasional meltdown hypothesis. The results of this study highlight the importance of considering acquired plant–animal interactions and stochasticity when evaluating the population growth rates and dynamics of invasive plants, and suggest that this invasive orchid will continue to spread in Puerto Rico.

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